Ludovica Schaerf

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Education

March 2023 - December 2026 (expected)

Ph.D. Fellowship in Digital Visual Studies

Max Planck Society (MPG) and the University of Zurich (UZH), Zurich, Switzerland.

Supervisors: Prof. Tristan Weddigen (MPG-UZH), Dr. Leonardo Impett (Uni. Cambridge), Prof. Eric Postma (Uni. Tilburg).

- Proposal: Improve current understanding of the latent spaces of **vision generative models**, including **disentanglement** techniques, **multi-modal** guidance methods, and mapping across latent spaces,
- Analysis of which forms of understanding can be manifested through disentangled abstract dimensions and which through textual, discursive guidance or other forms of guidance.
- Broader context on **machine perception**, cultural and social implications of large AI vision models, **computational creativity,** and the **arts** sector,
- Currently: adjusting disentanglement methods for **StyleGAN3** and **Stable Diffusion** for visual pattern manipulation of textile images.

Sept. 2020 - July 2022

Master of Science in Data Science for Digital Humanities

École Polytechnique Fédérale de Lausanne (EPFL), Ecublens, Switzerland, GPA: 5.75/6.0.

Sept. 2017 - July 2020

Bachelor of Science in Computer Science

Amsterdam University College (AUC), Amsterdam, Netherlands, GPA: 3.95/4.00, Summa Cum Laude.

Publications

June 2023

"The diachronic development of Debussy's musical style: a corpus study with Discrete Fourier Transform".
Sabrina Laneve*, Ludovica Schaerf*, Gabriele Cecchetti*, Johannes Hentschel*, and Martin Rohrmeier.
(in *Nature Humanities and Social Sciences Communications*, paper: https://doi.org/10.1057/s41599-023-01796-7, code: https://github.com/DCMLab/debussy_piano)

- Distant listening approach to music pieces analysis,
- Application of **Discrete Fourier Transform** and development of ad-hoc metrics for musical interpretation.

September 2023

"Transhistorical Urban Landscape as Hypermap".
Dario Negueruela del Castillo*, Iacopo Neri*, Paul Guhennec*, Ludovica Schaerf*, Valentine Bernasconi* and Pepe Ballesteros Zapata*.
(in *ACM Conference on Hypertext and Social Media HT2023*)

- Conception, design, implementation, and contextualization of a **hypertextual map**,
- Proof of concept: an augmented database of the urban landscape in the city of Rome between XV century and contemporary Rome.

July 2023

"Art Authentication with Vision Transformers".
Ludovica Schaerf, Eric Postma, Carina Popovici.
(in *Springer for Neural Computing and Applications*, special issue on "Topical Collection on Visual Pattern Recognition and Extraction for Cultural Heritage", preprint: https://doi.org/10.48550/arXiv.2307.03039)

- Comparative study between **Convolutional Neural Networks** and **Vision Transformers** on the task of art authentication,
- The paper shows the superiority of **Swin Transfomer** over **EfficientNetB5** on forgeries detection.

Under review

"AI Art Curation: Re-imagining the City of Helsinki on the Occasion of its Biennial".
Ludovica Schaerf*, Pepe Ballesteros*, Valentine Bernasconi*, Iacopo Neri* and Dario Negueruela del Castillo*.
(First part of the work presented at the CVPR EC3V workshop, preprint: https://doi.org/10.48550/arXiv.2306.03753, website: http://newlyformedcity.net/).

- AI curation for the 2023 Helsinki Biennial of Art.
- Novel similarity-based method for fictional coordinate prediction using **CLiP** textual and visual embeddings,
- Application of depth-map guidance for **Stable Diffusion** to panoramic artwork generation,
- Includes conceptual and methodological framework on the machinic view of a parallel city of Helsinki using the local artworks.

Accepted

"Synthetic images aid the recognition of human-made art forgeries".
Ludovica Schaerf*, Johann Ostmeyer*, Pavel Buividovich, Tessa Charles and Carina Popovici.

(*PLOS ONE*, accepted)
- Study on the effect of **synthetic images** generated with **StyleGAN** and **Stable Diffusion** in datasets for art authentication,
- Case studies of Modigliani and Raphael,
- The paper shows a radical improvement both in forgeries detection and against **adversarial attacks** by synthetic images.

Honors and Awards

June 2023

Best Paper Award, awarded for the best paper at the *CVPR workshop on Ethical Considerations in Creative Applications of Computer Vision (EC3V), 2023*.
Presentation: "Towards AI Art Curation: Re-imagining the city of Helsinki on the occasion of its Biennial".

July 2022

Best Poster Presentation, awarded for the best short presentation at the *IMA Maths and Music conference at the Royal College of Music London*.
Presentation: "Discrete Fourier Transform unveils decreasing diatonicity and increasing fragmentation in Debussy's piano music".

Sept. 2020

MS Excellence Fellowship, granted by *EPFL* for outstanding academic performance during the Bachelor's degree.

Work and Academic Experiences

Feb. 2023 - March 2023

Senior AI Developer

Art Recognition, Adliswil, Switzerland, https://art-recognition.com/.
Carina Popovici (CEO), Prof. Eric Postma (Tilburg University AI lab)
- Tasked with coordinating and supervising the technology team (<5 people),
- Tasked with handling the company R&D,
- Covered all CTO tasks *interim* (cloud services coordination **Azure** and **AWS**, company accounts, hiring),
- Improved model accuracy by over 30%, introducing combinations of state-of-the-art models such as **Swin Transformer** with **Pix2Pix**,
- Improved and sped up **data collection** from 3 days to 3 hours for the entire collection, introducing new data scrapers, hashing-based deduplication process, automatic metadata collection, and update.

Feb. 2022 - July 2022

Master Thesis

DHLab, EPFL, Ecublens, Switzerland.
Prof. Frédéric Kaplan,
- Built a **triplet learning** network with **ResNeXt** base architecture to detect when two artworks share the same visual pattern.
- Clustered using **density-based clustering** methods to be later annotated for continual training (**human-in-the-loop**).
- Increased the number of annotated visual patterns in Renaissance and Baroque art history from 500 to 1800 through repeated human annotation of the generated clusters.

Sept. 2021 - Jan. 2022

Teaching Assistant at 'Applied Data Analysis' MSc Course

DLab, *EPFL*, Ecublens, Switzerland,
Dr. Bob West,
- Tasked with supervision and grading of student projects tackling **data science** problems (500+ students),
- Revision of the course's assignments and grading of the student submissions.

July 2021 - Jan. 2022

Data Science for Digital Humanities Internship

Peter Lang AG, Lausanne, Switzerland,
Daniela Toma (project manager),
- Created a social science and humanities books dissemination platform, developed in plain **HTML**, **PHP,** and **CSS**,
- Improved **search** and **filtering** tools and interactive visualizations, using **Elasticsearch**, and **Javascript**,
- Extracted 40+ new metadata fields for each book using **NER**, **Bert**, and **Word2Vec**, which are used for improved searching options such as filtering, visualizations, and sorting.

Sept. 2019 - Aug. 2020

Data Science Internship

Machine Learning Programs, Amsterdam, Netherlands, https://www.mlprograms.com/.
Prof. Breanndán ó Nualláin (CEO),
- Developed machine learning **regression models** to investigate insurer and broker behaviors in **Sklearn**, **PyTorch,** and **TensorFlow**,
- Created an internal **visualization toolkit** for the models, useful for eyeballing outlier detection, feature correlations, and prediction failures.
- Set up the company's database in **PostgreSQL** for optimized querying of historic data summaries and statistics,
- Sped up the querying by a factor of 10x over the previous Python-based approach, introducing the db and tailored views,
- Teaching assistant at BSc Intensive Course *'Information Lab'* held in conjunction between the company and Amsterdam University College.

Technological Skills

Programming Languages: Python (proficient), Matlab, R, C, Javascript (including d3.js, Three.js, Leaflet.js).
Machine Learning and Deep Learning (proficient)**:** Pytorch, Tensorflow, Sklearn, Spacy, Scipy, OpenCV.
Databases: PostgreSQL, Elasticsearch (NoSQL).
Miscellaneous: Git, Latex, Microsoft Office (Excel), CSS, Bootstrap, HTML5.

Languages

Italian: Native Speaker - Advanced
English: C.2 Level - Advanced
Dutch: B.1 Level - Intermediate
French: B.1 Level - Intermediate
German: A.2 Level - Basic